



## TFT LCD Tentative Specification

# MODEL NO.: N173H6 - L02

Customer : \_\_\_\_\_

Approved by : \_\_\_\_\_

Note :

| 記錄                         | 工作                   | 審核                               | 角色       | 投票     |
|----------------------------|----------------------|----------------------------------|----------|--------|
| 2009-01-23<br>11:48:00 CST | PMMD III<br>Director | annie_hsu(徐凡琇<br>/56522 / 54873) | Director | Accept |



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REVISION HISTORY

| Version  | Date         | Page<br>(New) | Section | Description                              |
|----------|--------------|---------------|---------|------------------------------------------|
| Ver. 0.0 | Jan. 16, '08 | All           | All     | Tentative Specification was first issued |



## 1. GENERAL DESCRIPTION

### 1.1 OVERVIEW

N173H6 - L02 is a 17.3" TFT Liquid Crystal Display module with LED Backlight unit and 40 pins LVDS interface. This module supports 1920 x 1080 FHD mode and can display 262,144 colors. The optimum viewing angle is at 6 o'clock direction. The inverter module for Backlight is built in.

### 1.2 FEATURES

- FHD (1920 x 1080 pixels) resolution
- DE only mode
- 3.3V LVDS (Low Voltage Differential Signaling) interface with 2 pixel/clock
- WLED

### 1.3 APPLICATION

- TFT LCD Notebook

### 1.4 GENERAL SPECIFICATIONS

| Item               | Specification                              | Unit  | Note |
|--------------------|--------------------------------------------|-------|------|
| Active Area        | 381.888 (H) x 214.812 (V) (17.3" diagonal) | mm    | (1)  |
| Bezel Opening Area | 386.88 (H) x 218.32 (V)                    | mm    |      |
| Driver Element     | a-si TFT active matrix                     | -     | -    |
| Pixel Number       | 1920 x R.G.B. x 1080                       | pixel | -    |
| Pixel Pitch        | 0.199 x 0.199                              | mm    | -    |
| Pixel Arrangement  | RGB vertical stripe                        | -     | -    |
| Display Colors     | 262,144                                    | color | -    |
| Transmissive Mode  | Normally white                             | -     | -    |
| Surface Treatment  | Hard coating (3H), Glare                   | -     | -    |

### 1.5 MECHANICAL SPECIFICATIONS

| Item        |                | Min.  | Typ.  | Max.  | Unit | Note |
|-------------|----------------|-------|-------|-------|------|------|
| Module Size | Horizontal (H) | 397.6 | 398.1 | 398.6 | mm   | (1)  |
|             | Vertical (V)   | 232.3 | 232.8 | 233.3 | mm   |      |
|             | Depth (D)      |       | 5.5   | 5.8   | mm   |      |
| Weight      |                |       | 530   | 545   | g    |      |

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.



## 2. ABSOLUTE MAXIMUM RATINGS

### 2.1 ABSOLUTE RATINGS OF ENVIRONMENT

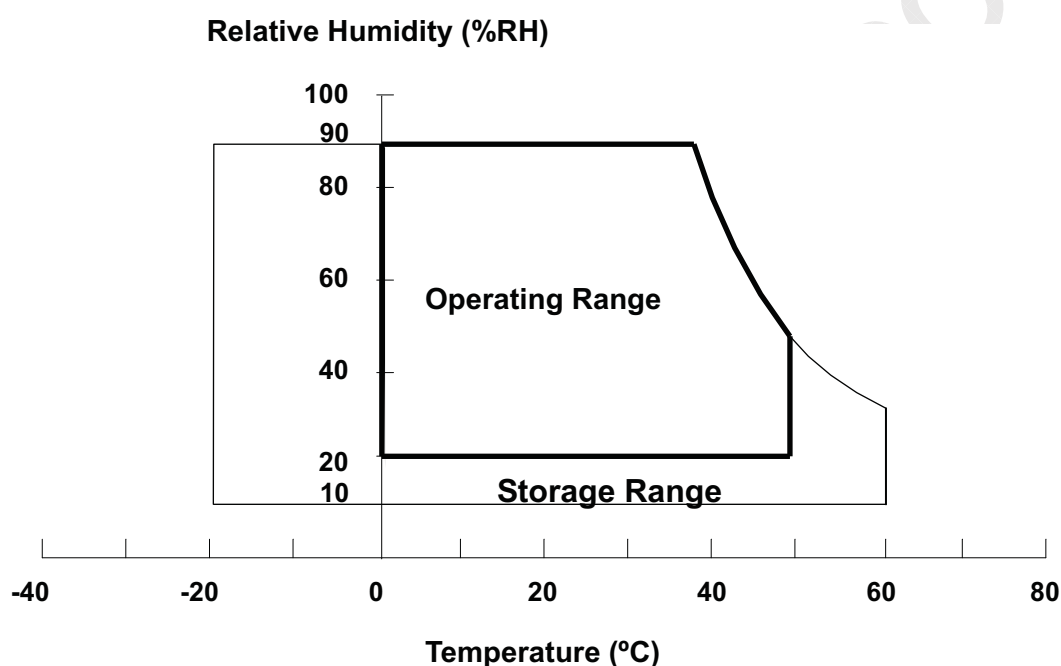
| Item                          | Symbol           | Value |       | Unit | Note     |
|-------------------------------|------------------|-------|-------|------|----------|
|                               |                  | Min.  | Max.  |      |          |
| Storage Temperature           | T <sub>ST</sub>  | -20   | +60   | °C   | (1)      |
| Operating Ambient Temperature | T <sub>OP</sub>  | 0     | +50   | °C   | (1), (2) |
| Shock (Non-Operating)         | S <sub>NOP</sub> | -     | 220/2 | G/ms | (3), (5) |
| Vibration (Non-Operating)     | V <sub>NOP</sub> | -     | 1.5   | G    | (4), (5) |

Note (1) (a) 90 %RH Max. (Ta ≤ 40 °C).

(b) Wet-bulb temperature should be 39 °C Max. (Ta > 40 °C).

(c) No condensation.

Note (2) The temperature of panel display surface area should be 0 °C Min. and 60 °C Max.



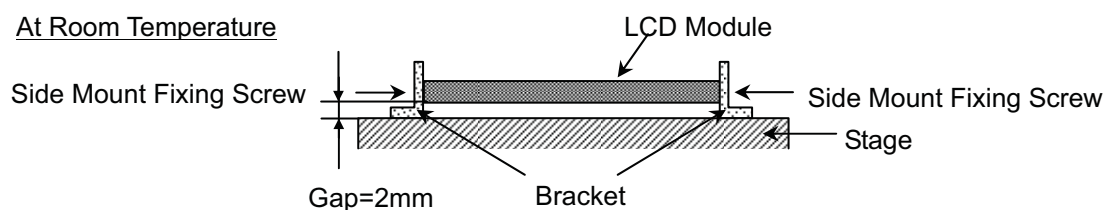
Note (3) 1 time for ± X, ± Y, ± Z. for Condition (220G / 2ms) is half Sine Wave,.

Note (4) 10 ~ 500 Hz, 30 min/cycle, 1 cycles for each X, Y, Z axis.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

The fixing condition is shown as below:

At Room Temperature





## 2.2 ELECTRICAL ABSOLUTE RATINGS

### 2.2.1 TFT LCD MODULE

| Item                 | Symbol   | Value |              | Unit | Note |
|----------------------|----------|-------|--------------|------|------|
|                      |          | Min.  | Max.         |      |      |
| Power Supply Voltage | $V_{CC}$ | -0.3  | +4.0         | V    | (1)  |
| Logic Input Voltage  | $V_{IN}$ | -0.3  | $V_{CC}+0.3$ | V    |      |

### 2.2.2 BACKLIGHT UNIT

| Item                               | Symbol | Value |      | Unit | Note     |
|------------------------------------|--------|-------|------|------|----------|
|                                    |        | Min.  | Max. |      |          |
| LED Light Bar Power Supply Voltage | $V_L$  | -45   | 31.5 | V    | (1), (2) |
| LED Light Bar Power Supply Current | $I_L$  | 0     | 200  | mA   |          |

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for LED (Refer to 3.2 for further information).


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### 3. ELECTRICAL CHARACTERISTICS

#### 3.1 TFT LCD MODULE

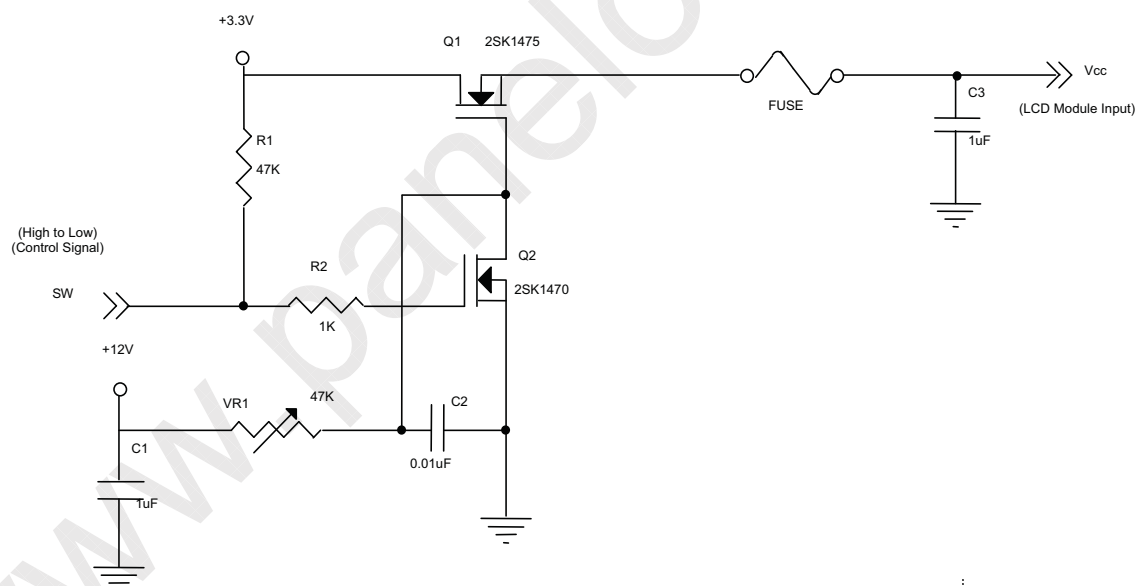
| Parameter                              | Symbol                | Value |       |       | Unit | Note                          |
|----------------------------------------|-----------------------|-------|-------|-------|------|-------------------------------|
|                                        |                       | Min.  | Typ.  | Max.  |      |                               |
| Power Supply Voltage                   | V <sub>CC</sub>       | 3.0   | 3.3   | 3.6   | V    | -                             |
| Permissible Ripple Voltage             | V <sub>RP</sub>       |       | 50    |       | mV   | -                             |
| Rush Current                           | I <sub>RUSH</sub>     |       |       | 1.5   | A    | (2)                           |
| Initial Stage Current                  | I <sub>IS</sub>       |       |       | 1.0   | A    | (2)                           |
| Power Supply Current                   | White                 |       | (390) |       | mA   | (3)a                          |
|                                        | Black                 |       | (750) |       | mA   | (3)b                          |
| LVDS Differential Input High Threshold | V <sub>TH(LVDS)</sub> |       |       | +100  | mV   | (5),<br>V <sub>CM</sub> =1.2V |
| LVDS Differential Input Low Threshold  | V <sub>TL(LVDS)</sub> | -100  |       |       | mV   | (5),<br>V <sub>CM</sub> =1.2V |
| LVDS Common Mode Voltage               | V <sub>CM</sub>       | 1.125 |       | 1.375 | V    | (5)                           |
| LVDS Differential Input Voltage        | V <sub>ID</sub>       | 100   |       | 600   | mV   | (5)                           |
| Terminating Resistor                   | R <sub>T</sub>        |       | 100   |       | Ohm  |                               |
| Power per EBL WG                       | P <sub>EBL</sub>      | -     | (TBD) | -     | W    | (4)                           |

Note (1) The ambient temperature is Ta = 25 ± 2 °C.

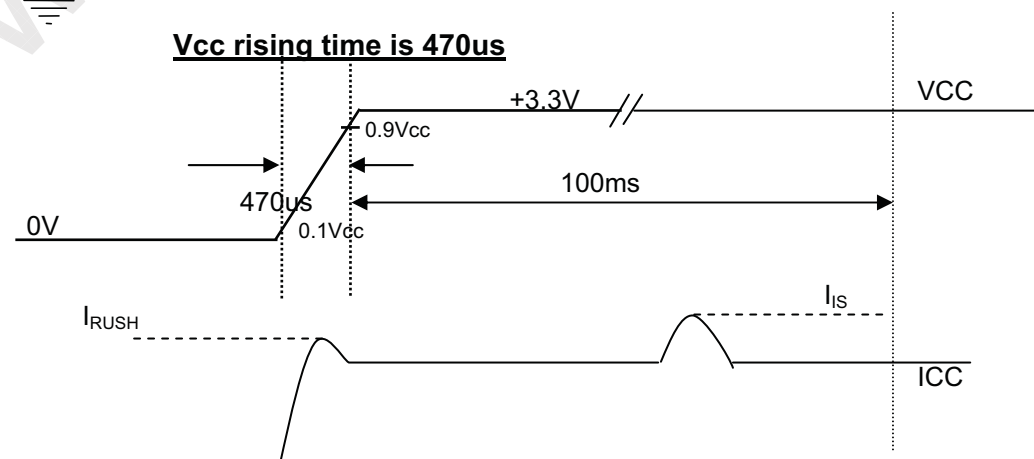
Note (2) I<sub>RUSH</sub>: the maximum current when VCC is rising

I<sub>IS</sub>: the maximum current of the first 100ms after power-on

Measurement Conditions: Shown as the following figure. Test pattern: black.



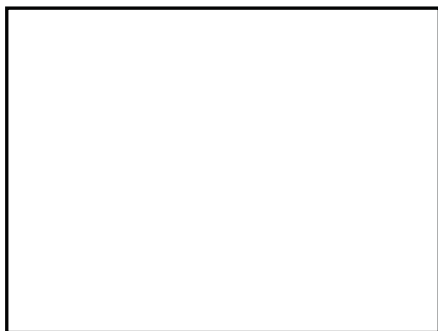
**VCC rising time is 470us**





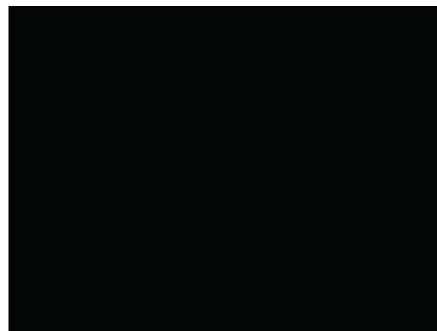
Note (3) The specified power supply current is under the conditions at  $V_{CC} = 3.3\text{ V}$ ,  $T_a = 25 \pm 2\text{ }^{\circ}\text{C}$ ,  $f_v = 60\text{ Hz}$ , whereas a power dissipation check pattern below is displayed.

a. White Pattern



Active Area

b. Black Pattern



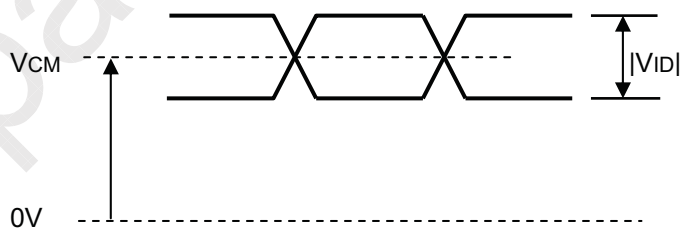
Active Area

Note (4) The specified power are the sum of LCD panel electronics input power and the inverter input power. Test conditions are as follows.

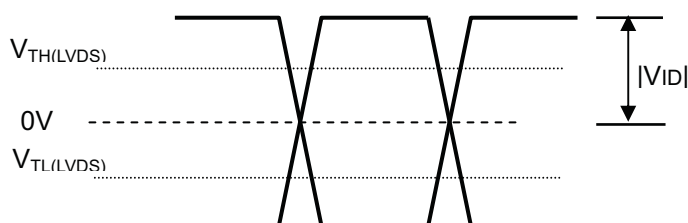
- (a)  $V_{CC} = 3.3\text{ V}$ ,  $T_a = 25 \pm 2\text{ }^{\circ}\text{C}$ ,  $f_v = 60\text{ Hz}$ ,
- (b) The pattern used is a black and white 32 x 36 checkerboard, slide #100 from the VESA file "Flat Panel Display Monitor Setup Patterns", FPDMSU.ppt.
- (c) Luminance: 60 nits.

Note (5) The parameters of LVDS signals are defined as the following figures.

Single Ended



Differential





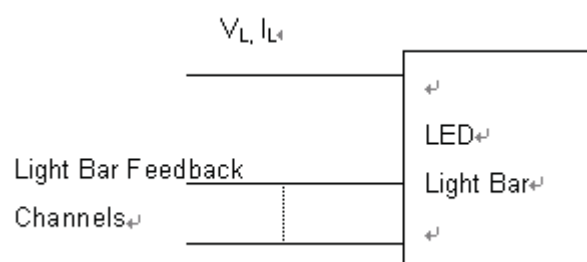


### 3.2 BACKLIGHT UNIT

 $T_a = 25 \pm 2\text{ }^{\circ}\text{C}$ 

| Parameter                          | Symbol   | Value |      |      | Unit | Note                |
|------------------------------------|----------|-------|------|------|------|---------------------|
|                                    |          | Min.  | Typ. | Max. |      |                     |
| LED Light Bar Power Supply Voltage | $V_L$    | 25.2  | 28.8 | 31.5 | V    | (1),(2) (Duty 100%) |
| LED Light Bar Power Supply Current | $I_L$    | 152   | 160  | 168  | mA   |                     |
| Power Consumption                  | $P_L$    | 3.83  | 4.60 | 5.29 | W    | (3), (Duty 100%)    |
| LED Life Time                      | $L_{BL}$ | 15000 | -    | -    | Hrs  | (4)                 |

Note (1) LED light bar configuration is shown as below.



Note (2) For better LED light bar driving quality, it is recommended to utilize the adaptive boost converter with current balancing function to drive LED light-bar.

Note (3)  $P_L = I_L \times V_L$

Note (4) The lifetime of LED is defined as the time when it continues to operate under the conditions at  $T_a = 25 \pm 2\text{ }^{\circ}\text{C}$  and  $I_L = 20\text{ mA}$ (Per EA) until the brightness becomes  $\leq 50\%$  of its original value.

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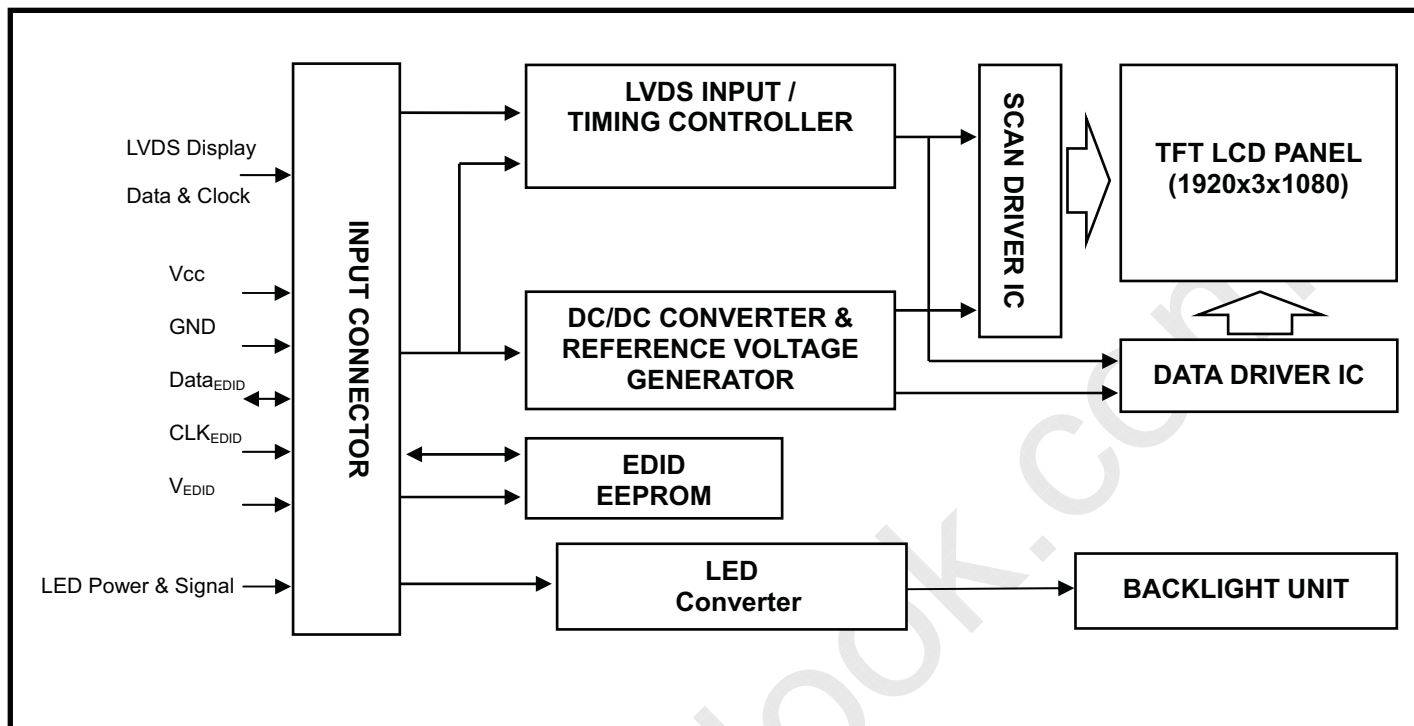
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## 4. BLOCK DIAGRAM

### 4.1 TFT LCD MODULE





## 5. INPUT TERMINAL PIN ASSIGNMENT

### 5.1 TFT LCD MODULE

| Pin | Symbol               | Description                         | Polarity | Remark |
|-----|----------------------|-------------------------------------|----------|--------|
| 1   | Vss                  | Non connection                      |          |        |
| 2   | Vcc                  | Power Supply +3.3 V (typical)       |          |        |
| 3   | Vcc                  | Power Supply +3.3 V (typical)       |          |        |
| 4   | V <sub>EDID</sub>    | DDC 3.3V Power                      |          |        |
| 5   | Reserve              | Non connection                      |          |        |
| 6   | CLK <sub>EDID</sub>  | DDC Clock                           |          |        |
| 7   | DATA <sub>EDID</sub> | DDC Data                            |          |        |
| 8   | RX00-                | LVDS Differential Data Input (Odd)  | Negative |        |
| 9   | RX00+                | LVDS Differential Data Input (Odd)  | Positive |        |
| 10  | Vss                  | Ground                              |          |        |
| 11  | RX01-                | LVDS Differential Data Input (Odd)  | Negative |        |
| 12  | RX01+                | LVDS Differential Data Input (Odd)  | Positive |        |
| 13  | Vss                  | Ground                              |          |        |
| 14  | RX02-                | LVDS Differential Data Input (Odd)  | Negative |        |
| 15  | RX02+                | LVDS Differential Data Input (Odd)  | Positive |        |
| 16  | Vss                  | Ground                              |          |        |
| 17  | RXOC-                | LVDS Clock Data Input (Odd)         | Negative |        |
| 18  | RXOC+                | LVDS Clock Data Input (Odd)         | Positive |        |
| 19  | Vss                  | Ground                              |          |        |
| 20  | RxE0-                | LVDS Differential Data Input (Even) | Negative |        |
| 21  | RxE0+                | LVDS Differential Data Input (Even) | Positive |        |
| 22  | Vss                  | Ground                              |          |        |
| 23  | RxE1-                | LVDS Differential Data Input (Even) | Negative |        |
| 24  | RxE1+                | LVDS Differential Data Input (Even) | Positive |        |
| 25  | Vss                  | Ground                              |          |        |
| 26  | RxE2-                | LVDS Differential Data Input (Even) | Negative |        |
| 27  | RxE2+                | LVDS Differential Data Input (Even) | Positive |        |
| 28  | Vss                  | Ground                              |          |        |
| 29  | RXEC-                | LVDS Clock Data Input (Even)        | Negative |        |
| 30  | RXEC+                | LVDS Clock Data Input (Even)        | Positive |        |
| 31  | GND                  | Ground                              |          |        |
| 32  | LED_GND              | LED Ground                          |          |        |
| 33  | LED_GND              | LED Ground                          |          |        |
| 34  | Reserve              | No Connection                       |          |        |
| 35  | LED_PWM              | System PWM Signal Input             |          |        |
| 36  | LED_EN               | LED enable pin                      |          |        |
| 37  | NC                   | No Connection                       |          |        |
| 38  | LED_VCCS             | LED Power                           |          |        |
| 39  | LED_VCCS             | LED Power                           |          |        |
| 40  | LED_VCCS             | LED Power                           |          |        |

Note (1) Connector Part No.: I-PEX 20455-040E-12, Foxconn GS13401-1110P-7F, or equivalent

Note (2) User's connector Part No: I-PEX 20453-040T-01 or equivalent

Note (3) The first pixel is odd as shown in the following figure.

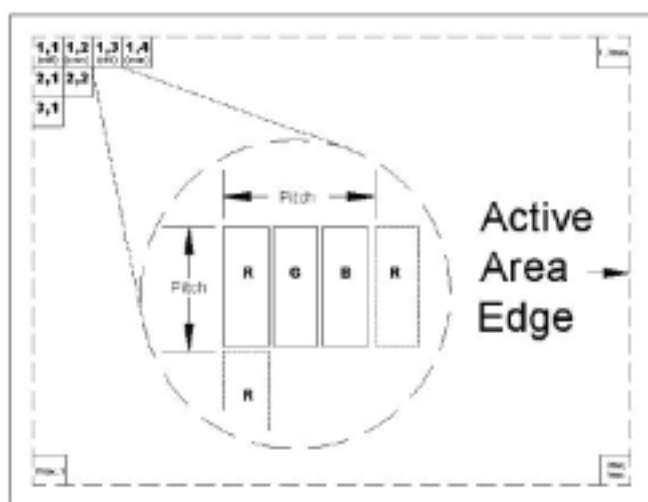


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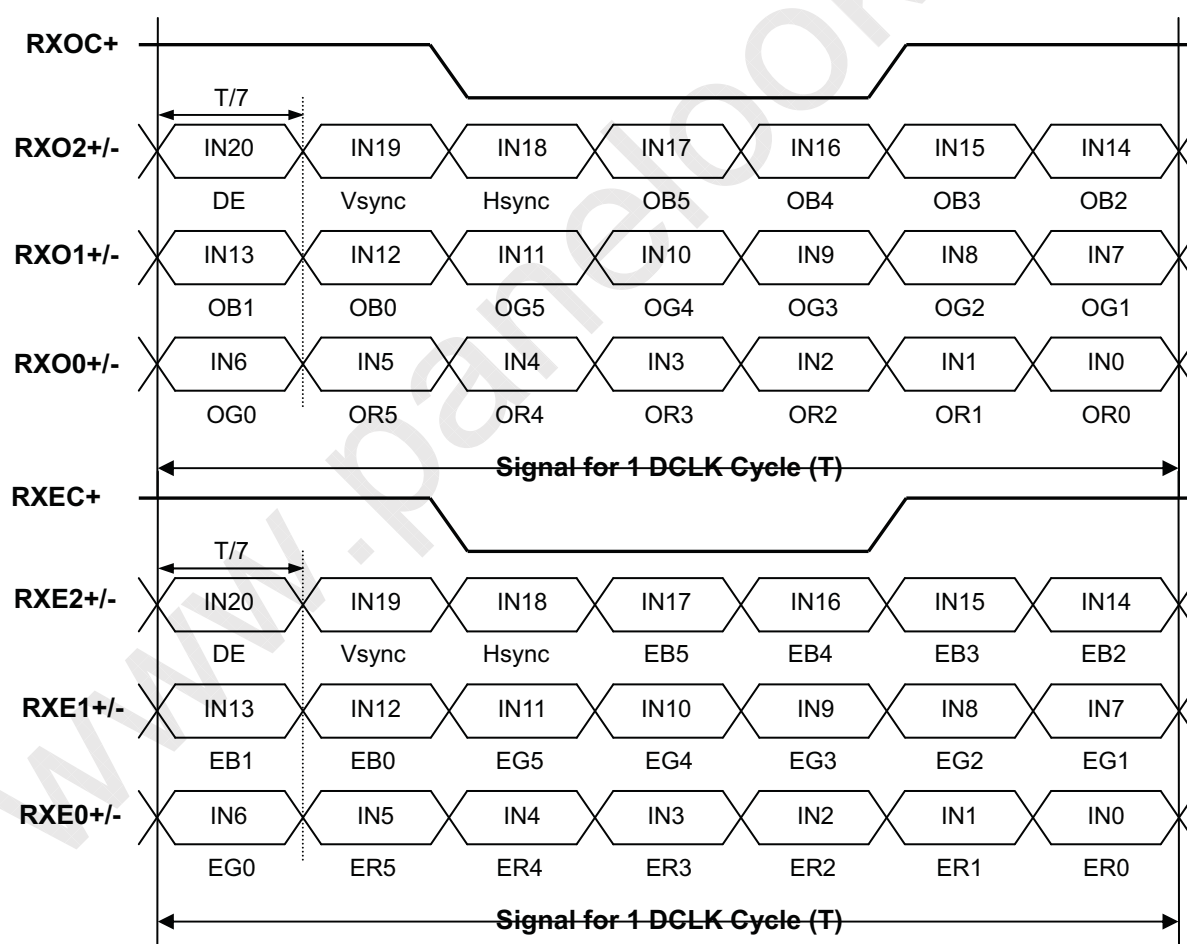
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## 5.2 TIMING DIAGRAM OF LVDS INPUT SIGNAL





### 5.3 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 6-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

| Color               |               | Data Signal |    |    |    |    |    |       |    |    |    |    |    |      |    |    |    |    |    |
|---------------------|---------------|-------------|----|----|----|----|----|-------|----|----|----|----|----|------|----|----|----|----|----|
|                     |               | Red         |    |    |    |    |    | Green |    |    |    |    |    | Blue |    |    |    |    |    |
|                     |               | R5          | R4 | R3 | R2 | R1 | R0 | G5    | G4 | G3 | G2 | G1 | G0 | B5   | B4 | B3 | B2 | B1 | B0 |
| Basic Colors        | Black         | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Red           | 1           | 1  | 1  | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Green         | 0           | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Blue          | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 1  | 1    | 1  | 1  | 1  | 1  | 1  |
|                     | Cyan          | 0           | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  |
|                     | Magenta       | 1           | 1  | 1  | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  |
|                     | Yellow        | 1           | 1  | 1  | 1  | 1  | 1  | 1     | 1  | 1  | 1  | 1  | 1  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | White         | 1           | 1  | 1  | 1  | 1  | 1  | 1     | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  |
| Gray Scale Of Red   | Red(0)/Dark   | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Red(1)        | 0           | 0  | 0  | 0  | 0  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Red(2)        | 0           | 0  | 0  | 0  | 1  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | :             | :           | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  |
|                     | :             | :           | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  |
|                     | :             | :           | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  |
|                     | Red(61)       | 1           | 1  | 1  | 1  | 0  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Red(62)       | 1           | 1  | 1  | 1  | 1  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
| Red(63)             | 1             | 1           | 1  | 1  | 1  | 1  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  |    |
| Gray Scale Of Green | Green(0)/Dark | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Green(1)      | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 1  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Green(2)      | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 1  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | :             | :           | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  |
|                     | :             | :           | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  |
|                     | :             | :           | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  |
|                     | Green(61)     | 0           | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 0  | 1  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Green(62)     | 0           | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
| Green(63)           | 0             | 0           | 0  | 0  | 0  | 0  | 1  | 1     | 1  | 1  | 1  | 1  | 0  | 0    | 0  | 0  | 0  | 0  |    |
| Gray Scale Of Blue  | Blue(0)/Dark  | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  |
|                     | Blue(1)       | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 1  |
|                     | Blue(2)       | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 1  | 0  |
|                     | :             | :           | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  |
|                     | :             | :           | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  |
|                     | :             | :           | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  |
|                     | Blue(61)      | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 1  | 1    | 1  | 1  | 0  | 1  | 1  |
|                     | Blue(62)      | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 1  | 1    | 1  | 1  | 1  | 0  | 0  |
| Blue(63)            | 0             | 0           | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 1  | 1  | 1    | 1  | 1  | 1  | 1  |    |

Note (1) 0: Low Level Voltage, 1: High Level Voltage



## 5.4 EDID DATA STRUCTURE

The EDID (Extended Display Identification Data) data formats are to support displays as defined in the

| Byte # (decimal) | Byte # (hex) | Field Name and Comments                      | Value (hex) | Value (binary) |
|------------------|--------------|----------------------------------------------|-------------|----------------|
| 0                | 0            | Header                                       | 00          | 00000000       |
| 1                | 1            | Header                                       | FF          | 11111111       |
| 2                | 2            | Header                                       | FF          | 11111111       |
| 3                | 3            | Header                                       | FF          | 11111111       |
| 4                | 4            | Header                                       | FF          | 11111111       |
| 5                | 5            | Header                                       | FF          | 11111111       |
| 6                | 6            | Header                                       | FF          | 11111111       |
| 7                | 7            | Header                                       | 00          | 00000000       |
| 8                | 8            | EISA ID manufacturer name ("CMO")            | 0D          | 00001101       |
| 9                | 9            | EISA ID manufacturer name (Compressed ASCII) | AF          | 10101111       |
| 10               | 0A           | ID product code (N173H6-L02)                 | 12          | 00010010       |
| 11               | 0B           | ID product code (hex LSB first; N173H6-L02)  | 17          | 00010111       |
| 12               | 0C           | ID S/N (fixed "0")                           | 00          | 00000000       |
| 13               | 0D           | ID S/N (fixed "0")                           | 00          | 00000000       |
| 14               | 0E           | ID S/N (fixed "0")                           | 00          | 00000000       |
| 15               | 0F           | ID S/N (fixed "0")                           | 00          | 00000000       |
| 16               | 10           | Week of manufacture (fixed week code)        | 2C          | 00101100       |
| 17               | 11           | Year of manufacture (fixed year code)        | 30          | 00110000       |
| 18               | 12           | EDID structure version # ("1")               | 01          | 00000001       |
| 19               | 13           | EDID revision # ("3")                        | 03          | 00000011       |
| 20               | 14           | Video I/P definition ("digital")             | 80          | 10000000       |
| 21               | 15           | Max H image size ("38.208cm")                | 26          | 00100110       |
| 22               | 16           | Max V image size ("21.832cm")                | 16          | 00010110       |
| 23               | 17           | Display Gamma (Gamma = "2.2")                | 78          | 01111000       |
| 24               | 18           | Feature support ("Active off, RGB Color")    | 0A          | 00001010       |
| 25               | 19           | Rx1, Rx0, Ry1, Ry0, Gx1, Gx0, Gy1, Gy0       | 05          | 00000101       |
| 26               | 1A           | Bx1, Bx0, By1, By0, Wx1, Wx0, Wy1, Wy0       | 35          | 00110101       |
| 27               | 1B           | Rx=0.609                                     | 9C          | 10011100       |
| 28               | 1C           | Ry=0.348                                     | 59          | 01011001       |
| 29               | 1D           | Gx=0.333                                     | 55          | 01010101       |
| 30               | 1E           | Gy=0.583                                     | 95          | 10010101       |
| 31               | 1F           | Bx=0.16                                      | 29          | 00101001       |
| 32               | 20           | By=0.081                                     | 14          | 00010100       |
| 33               | 21           | Wx=0.313                                     | 50          | 01010000       |
| 34               | 22           | Wy=0.329                                     | 54          | 01010100       |
| 35               | 23           | Established timings 1                        | 00          | 00000000       |
| 36               | 24           | Established timings 2                        | 00          | 00000000       |
| 37               | 25           | Manufacturer's reserved timings              | 00          | 00000000       |
| 38               | 26           | Standard timing ID # 1                       | 01          | 00000001       |
| 39               | 27           | Standard timing ID # 1                       | 01          | 00000001       |
| 40               | 28           | Standard timing ID # 2                       | 01          | 00000001       |
| 41               | 29           | Standard timing ID # 2                       | 01          | 00000001       |

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|    |    |                                                                                           |    |          |
|----|----|-------------------------------------------------------------------------------------------|----|----------|
| 42 | 2A | Standard timing ID # 3                                                                    | 01 | 00000001 |
| 43 | 2B | Standard timing ID # 3                                                                    | 01 | 00000001 |
| 44 | 2C | Standard timing ID # 4                                                                    | 01 | 00000001 |
| 45 | 2D | Standard timing ID # 4                                                                    | 01 | 00000001 |
| 46 | 2E | Standard timing ID # 5                                                                    | 01 | 00000001 |
| 47 | 2F | Standard timing ID # 5                                                                    | 01 | 00000001 |
| 48 | 30 | Standard timing ID # 6                                                                    | 01 | 00000001 |
| 49 | 31 | Standard timing ID # 6                                                                    | 01 | 00000001 |
| 50 | 32 | Standard timing ID # 7                                                                    | 01 | 00000001 |
| 51 | 33 | Standard timing ID # 7                                                                    | 01 | 00000001 |
| 52 | 34 | Standard timing ID # 8                                                                    | 01 | 00000001 |
| 53 | 35 | Standard timing ID # 8                                                                    | 01 | 00000001 |
| 54 | 36 | Detailed timing description # 1 Pixel clock ("149.8 MHz", According to VESA CVT Rev1.1)   | 84 | 10000100 |
| 55 | 37 | # 1 Pixel clock (hex LSB first)                                                           | 3A | 00111010 |
| 56 | 38 | # 1 H active ("1920")                                                                     | 80 | 10000000 |
| 57 | 39 | # 1 H blank ("301")                                                                       | 2D | 00101101 |
| 58 | 3A | # 1 H active : H blank ("1920 : 301")                                                     | 71 | 01110001 |
| 59 | 3B | # 1 V active ("1080")                                                                     | 38 | 00111000 |
| 60 | 3C | # 1 V blank ("44")                                                                        | 2C | 00101100 |
| 61 | 3D | # 1 V active : V blank ("1080 : 44")                                                      | 40 | 01000000 |
| 62 | 3E | # 1 H sync offset ("91")                                                                  | 5B | 01011011 |
| 63 | 3F | # 1 H sync pulse width ("60")                                                             | 3C | 00111100 |
| 64 | 40 | # 1 V sync offset : V sync pulse width ("6 : 12")                                         | 6C | 01101100 |
| 65 | 41 | # 1 H sync offset : H sync pulse width : V sync offset : V sync width ("91: 60 : 6 : 12") | 00 | 00000000 |
| 66 | 42 | # 1 H image size ("382.08 mm")                                                            | 7E | 01111110 |
| 67 | 43 | # 1 V image size ("218.32 mm")                                                            | DA | 11011010 |
| 68 | 44 | # 1 H image size : V image size ("382 : 218")                                             | 10 | 00010000 |
| 69 | 45 | # 1 H boarder ("0")                                                                       | 00 | 00000000 |
| 70 | 46 | # 1 V boarder ("0")                                                                       | 00 | 00000000 |
| 71 | 47 | # 1 Non-interlaced, Normal, no stereo, Separate sync, H/V pol Negatives                   | 18 | 00011000 |
| 72 | 48 | Detailed timing description # 2                                                           | 00 | 00000000 |
| 73 | 49 | # 2 Flag                                                                                  | 00 | 00000000 |
| 74 | 4A | # 2 Reserved                                                                              | 00 | 00000000 |
| 75 | 4B | # 2 FE (hex) defines ASCII string (Model Name "N173H6-L02", ASCII)                        | FE | 11111110 |
| 76 | 4C | # 2 Flag                                                                                  | 00 | 00000000 |
| 77 | 4D | # 2 1st character of name ("N")                                                           | 4E | 01001110 |
| 78 | 4E | # 2 2nd character of name ("1")                                                           | 31 | 00110001 |
| 79 | 4F | # 2 3rd character of name ("7")                                                           | 37 | 00110111 |
| 80 | 50 | # 2 4th character of name ("3")                                                           | 33 | 00110011 |
| 81 | 51 | # 2 5th character of name ("H")                                                           | 48 | 01001000 |
| 82 | 52 | # 2 6th character of name ("6")                                                           | 36 | 00110110 |
| 83 | 53 | # 2 7th character of name ("-")                                                           | 2D | 00101101 |
| 84 | 54 | # 2 8th character of name ("L")                                                           | 4C | 01001100 |
| 85 | 55 | # 2 9th character of name ("0")                                                           | 30 | 00110000 |





|     |    |                                                                   |    |          |
|-----|----|-------------------------------------------------------------------|----|----------|
| 86  | 56 | # 2 9th character of name ("2")                                   | 32 | 00110010 |
| 87  | 57 | # 2 New line character indicates end of ASCII string              | 0A | 00001010 |
| 88  | 58 | # 2 Padding with "Blank" character                                | 20 | 00100000 |
| 89  | 59 | # 2 Padding with "Blank" character                                | 20 | 00100000 |
| 90  | 5A | Detailed timing description # 3                                   | 00 | 00000000 |
| 91  | 5B | # 3 Flag                                                          | 00 | 00000000 |
| 92  | 5C | # 3 Reserved                                                      | 00 | 00000000 |
| 93  | 5D | # 3 FE (hex) defines ASCII string (Vendor "CMO", ASCII)           | FE | 11111110 |
| 94  | 5E | # 3 Flag                                                          | 00 | 00000000 |
| 95  | 5F | # 3 1st character of string ("C")                                 | 43 | 01000011 |
| 96  | 60 | # 3 2nd character of string ("M")                                 | 4D | 01001101 |
| 97  | 61 | # 3 3rd character of string ("O")                                 | 4F | 01001111 |
| 98  | 62 | # 3 New line character indicates end of ASCII string              | 0A | 00001010 |
| 99  | 63 | # 3 Padding with "Blank" character                                | 20 | 00100000 |
| 100 | 64 | # 3 Padding with "Blank" character                                | 20 | 00100000 |
| 101 | 65 | # 3 Padding with "Blank" character                                | 20 | 00100000 |
| 102 | 66 | # 3 Padding with "Blank" character                                | 20 | 00100000 |
| 103 | 67 | # 3 Padding with "Blank" character                                | 20 | 00100000 |
| 104 | 68 | # 3 Padding with "Blank" character                                | 20 | 00100000 |
| 105 | 69 | # 3 Padding with "Blank" character                                | 20 | 00100000 |
| 106 | 6A | # 3 Padding with "Blank" character                                | 20 | 00100000 |
| 107 | 6B | # 3 Padding with "Blank" character                                | 20 | 00100000 |
| 108 | 6C | Detailed timing description # 4                                   | 00 | 00000000 |
| 109 | 6D | # 4 Flag                                                          | 00 | 00000000 |
| 110 | 6E | # 4 Reserved                                                      | 00 | 00000000 |
| 111 | 6F | # 4 FE (hex) defines ASCII string (Model Name"N173H6-L02", ASCII) | FE | 11111110 |
| 112 | 70 | # 4 Flag                                                          | 00 | 00000000 |
| 113 | 71 | # 4 1st character of name ("N")                                   | 4E | 01001110 |
| 114 | 72 | # 4 2nd character of name ("1")                                   | 31 | 00110001 |
| 115 | 73 | # 4 3rd character of name ("7")                                   | 37 | 00110111 |
| 116 | 74 | # 4 4th character of name ("3")                                   | 33 | 00110011 |
| 117 | 75 | # 4 5th character of name ("H")                                   | 48 | 01001000 |
| 118 | 76 | # 4 6th character of name ("6")                                   | 36 | 00110110 |
| 119 | 77 | # 4 7th character of name ("-")                                   | 2D | 00101101 |
| 120 | 78 | # 4 8th character of name ("L")                                   | 4C | 01001100 |
| 121 | 79 | # 4 9th character of name ("0")                                   | 30 | 00110000 |
| 122 | 7A | # 4 9th character of name ("2")                                   | 32 | 00110010 |
| 123 | 7B | # 4 New line character indicates end of ASCII string              | 0A | 00001010 |
| 124 | 7C | # 4 Padding with "Blank" character                                | 20 | 00100000 |
| 125 | 7D | # 4 Padding with "Blank" character                                | 20 | 00100000 |
| 126 | 7E | Extension flag                                                    | 00 | 00000000 |
| 127 | 7F | Checksum                                                          | 5B | 01011011 |




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## 6. CONVERTER SPECIFICATION

### 6.1 ABSOLUTE MAXIMUM RATINGS

| Symbol          | Ratings     |
|-----------------|-------------|
| LED_VCCS        | -0.3V~28.0V |
| LED_GND         | -0.3V       |
| LED_PWM, LED_EN | -0.3V~5V    |

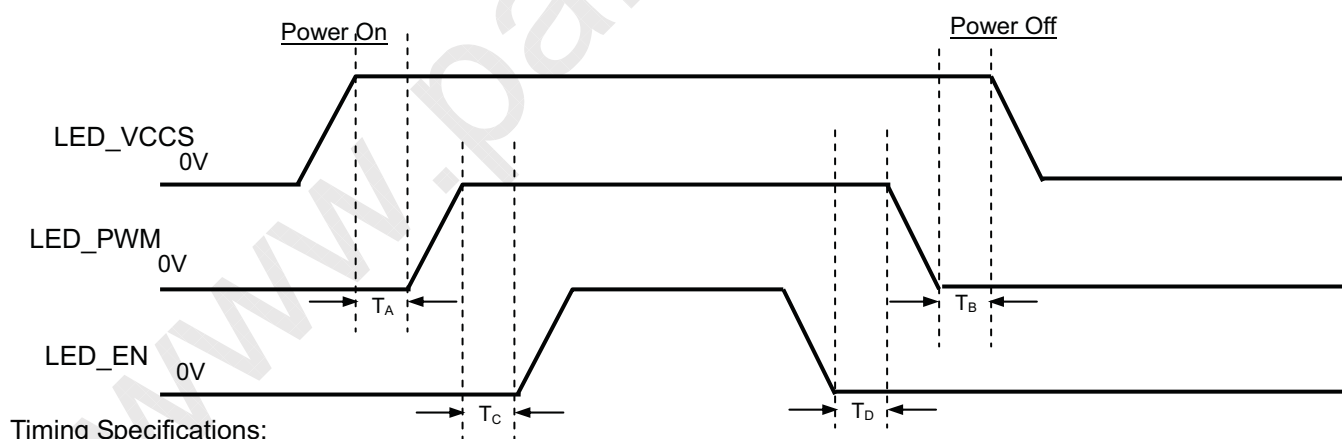
### 6.2 RECOMMENDED OPERATING RATINGS

| Parameter                             |                | Symbol           | Value |        |        | Unit | Note |
|---------------------------------------|----------------|------------------|-------|--------|--------|------|------|
|                                       |                |                  | Min.  | Typ.   | Max.   |      |      |
| Converter Input power supply voltage  |                | LED_Vccs         | (6.0) | (12.0) | (21.0) | V    |      |
| EN Control Level                      | Backlight On   |                  | (2.0) | ---    | (5.0)  | V    |      |
|                                       | Backlight Off  |                  | (0.0) | ---    | (0.8)  | V    |      |
| PWM Control Level                     | PWM High Level |                  | (2.0) | ---    | (5.0)  | V    |      |
|                                       | PWM Low Level  |                  | (0.0) | ---    | (0.15) | V    |      |
| PWM Control Duty Ratio                |                |                  | 20    |        | 100    | %    |      |
| PWM Control Permissive Ripple Voltage |                | VPWM_pp          |       |        | 100    | mV   |      |
| PWM Control Frequency                 |                | f <sub>PWM</sub> | (190) | (210)  | (230)  | Hz   |      |
| Converter Input Current               | LED_VCCS=Min   | I <sub>BL</sub>  | (591) | (703)  | (833)  | mA   | (1)  |
|                                       | LED_VCCS=Typ   |                  | (296) | (351)  | (417)  |      | (1)  |
|                                       | LED_VCCS=Max   |                  | (169) | (201)  | (238)  | mA   | (1)  |

Note (1) The specified LED power supply current is under the conditions at “LED\_VCCS = Min, Typ, Max”,

T<sub>a</sub> = 25 ± 2 °C, f<sub>PWM</sub> = 200 Hz, Duty=100%.

### 6.3 LED BACKLIGHT CONTROLL POWER SEQUENCE



$$T_A \geq (0\text{ms})$$

$$T_B \geq (0\text{ms})$$

$$T_C \geq (10\text{ms})$$

$$T_D \geq (0\text{ms})$$

Note (1) Please follow the LED backlight power sequence as above. If the customer could not follow, it might cause backlight flash issue during display ON/OFF or damage the LED backlight controller



## 7. INTERFACE TIMING

### 7.1 INPUT SIGNAL TIMING SPECIFICATIONS

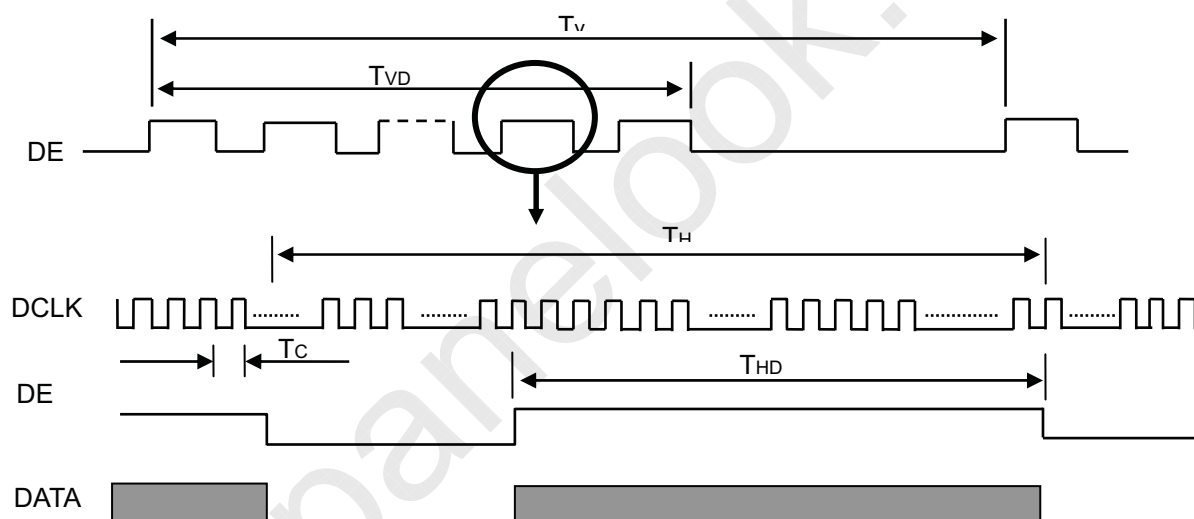
The input signal timing specifications are shown as the following table and timing diagram.

| Signal | Item                              | Symbol | Min.   | Typ.   | Max.   | Unit | Note |
|--------|-----------------------------------|--------|--------|--------|--------|------|------|
| DCLK   | Frequency                         | 1/Tc   | TBD    | 138.65 | TBD    | MHz  | (2)  |
| DE     | Vertical Total Time               | TV     | (1082) | 1111   | (1350) | TH   | -    |
|        | Vertical Active Display Period    | TVD    | 1080   | 1080   | 1080   | TH   | -    |
|        | Vertical Active Blanking Period   | TVB    | TV-TVD | 31     | TV-TVD | TH   |      |
|        | Horizontal Total Time             | TH     | (2000) | 2080   | (2400) | Tc   | (2)  |
|        | Horizontal Active Display Period  | THD    | 1920   | 1920   | 1920   | Tc   | (2)  |
|        | Horizontal Active Blanking Period | THB    | TH-THD | 160    | TH-THD | Tc   | (2)  |

Note (1) Because this module is operated by DE only mode, Hsync and Vsync are ignored.

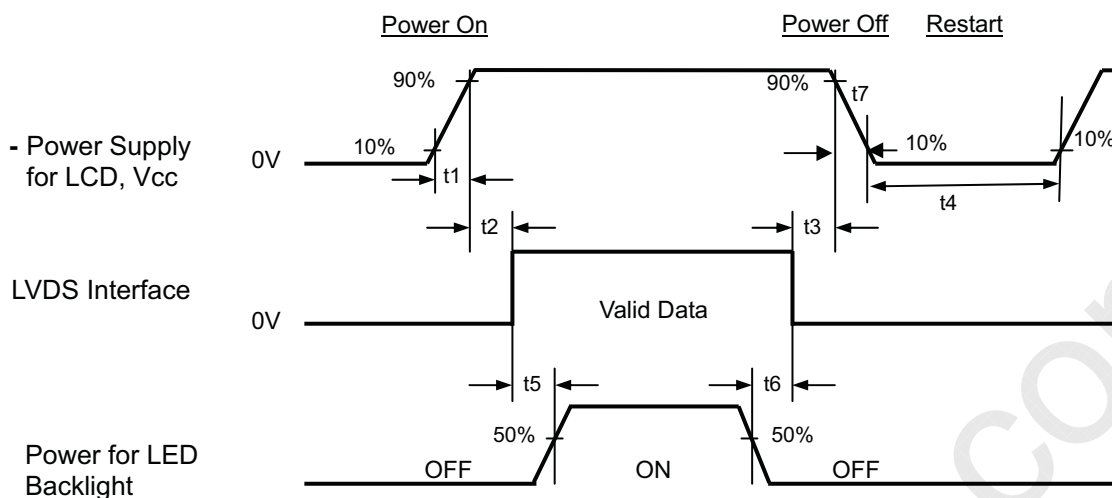
(2) 2 channels LVDS input.

INPUT SIGNAL TIMING DIAGRAM





## 7.2 POWER ON/OFF SEQUENCE



### Timing Specifications:

$$0.5 \leq t1 \leq 10 \text{ ms}$$

$$0 \leq t2 \leq 50 \text{ ms}$$

$$0 \leq t3 \leq 50 \text{ ms}$$

$$t4 \geq 500 \text{ ms}$$

$$t5 \geq 200 \text{ ms}$$

$$t6 \geq 200 \text{ ms}$$

Note (1) Please follow the power on/off sequence described above. Otherwise, the LCD module might be damaged.

Note (2) Please avoid floating state of interface signal at invalid period. When the interface signal is invalid, be sure to pull down the power supply of LCD Vcc to 0 V.

Note (3) The Backlight converter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight inverter power must be turned off before the power supply for the logic and the interface signal is invalid.

Note (4) Sometimes some slight noise shows when LCD is turned off (even backlight is already off). To avoid this phenomenon, we suggest that the Vcc falling time is better to follow  $(50\mu\text{s}) \leq t7 \leq (10 \text{ ms})$ .



## 8. OPTICAL CHARACTERISTICS

### 8.1 TEST CONDITIONS

| Item                              | Symbol                                                        | Value | Unit |
|-----------------------------------|---------------------------------------------------------------|-------|------|
| Ambient Temperature               | Ta                                                            | 25±2  | °C   |
| Ambient Humidity                  | Ha                                                            | 50±10 | %RH  |
| Supply Voltage                    | V <sub>CC</sub>                                               | 3.3   | V    |
| Input Signal                      | According to typical value in "3. ELECTRICAL CHARACTERISTICS" |       |      |
| LED Lightbar power supply Current | I <sub>L</sub>                                                | 160   | mA   |

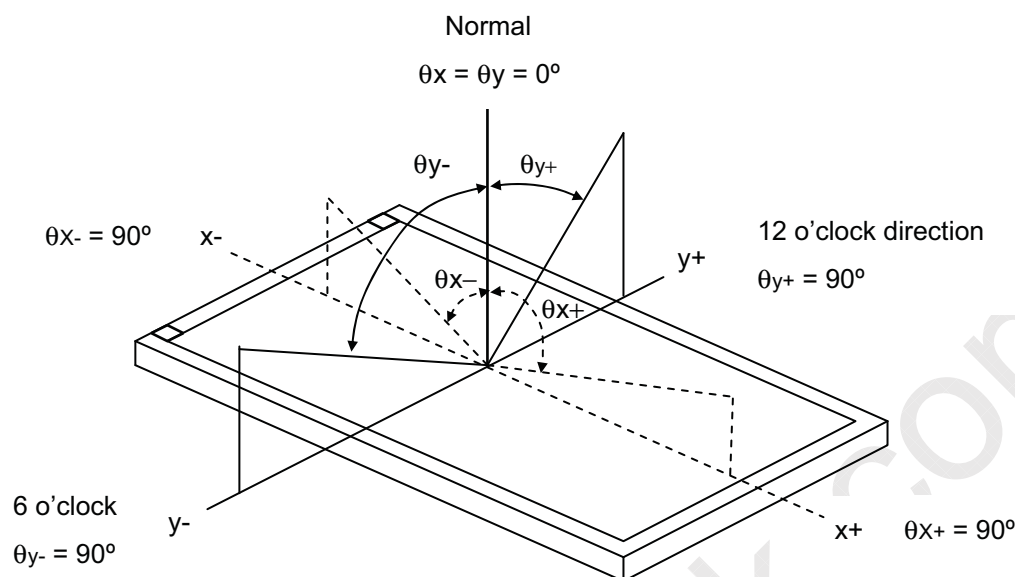
The relative measurement methods of optical characteristics are shown in 8.2. The following items should be measured under the test conditions described in 8.1 and stable environment shown in Note (5).

### 8.2 OPTICAL SPECIFICATIONS

| Item                       |            | Symbol           | Condition                                        | Min.       | Typ.    | Max.              | Unit     | Note     |
|----------------------------|------------|------------------|--------------------------------------------------|------------|---------|-------------------|----------|----------|
| Color Chromaticity         | Red        | R <sub>x</sub>   | $\theta_x=0^\circ, \theta_Y=0^\circ$<br>CS-1000T | Typ – 0.03 | (0.641) | Typ + 0.03        |          | (1), (5) |
|                            |            | R <sub>y</sub>   |                                                  |            | (0.351) |                   |          |          |
|                            | Green      | G <sub>x</sub>   |                                                  |            | (0.325) |                   |          |          |
|                            |            | G <sub>y</sub>   |                                                  |            | (0.631) |                   |          |          |
|                            | Blue       | B <sub>x</sub>   |                                                  |            | (0.156) |                   |          |          |
|                            |            | B <sub>y</sub>   |                                                  |            | (0.058) |                   |          |          |
|                            | White      | W <sub>x</sub>   |                                                  |            | 0.313   |                   |          |          |
|                            |            | W <sub>y</sub>   |                                                  |            | 0.329   |                   |          |          |
| Average Luminance of White |            | L <sub>AVE</sub> | (250)                                            | (300)      |         | cd/m <sup>2</sup> | (4), (5) |          |
| Contrast Ratio             |            | CR               | 500                                              | 650        |         | -                 | (2), (5) |          |
| Response Time              |            | T <sub>R</sub>   | $\theta_x=0^\circ, \theta_Y=0^\circ$             | ---        | 2       | 8                 | ms       | (3)      |
|                            |            | T <sub>F</sub>   |                                                  | ---        | 6       | 12                | ms       |          |
| White Variation            |            | ΔW               | $\theta_x=0^\circ, \theta_Y=0^\circ$             | ---        | 1.25    | 1.40              | -        | (5), (6) |
| Viewing Angle              | Horizontal | θ <sub>x</sub> + | CR ≥ 10                                          | (70)       | (80)    | ---               | Deg.     | (1), (5) |
|                            |            | θ <sub>x</sub> - |                                                  | (70)       | (80)    | ---               |          |          |
|                            | Vertical   | θ <sub>y</sub> + |                                                  | (60)       | (70)    | ---               |          |          |
|                            |            | θ <sub>y</sub> - |                                                  | (60)       | (70)    | ---               |          |          |



Note (1) Definition of Viewing Angle ( $\theta_x$ ,  $\theta_y$ ):



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{63} / L_0$$

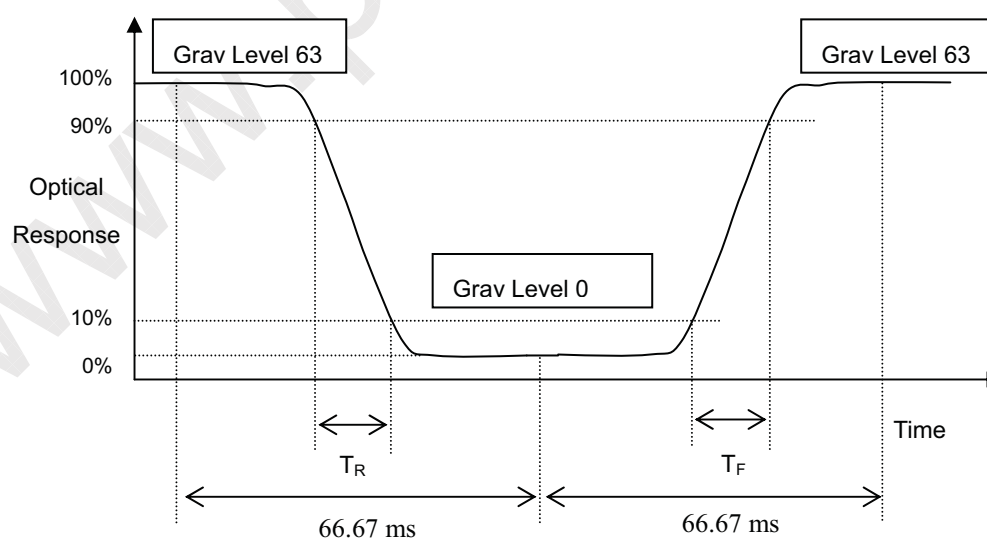
L63: Luminance of gray level 63

L 0: Luminance of gray level 0

$$\text{CR} = \text{CR} (1)$$

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (3) Definition of Response Time ( $T_R$ ,  $T_F$ ):



Note (4) Definition of Average Luminance of White ( $L_{AVE}$ ):

Measure the luminance of gray level 63 at 5 points

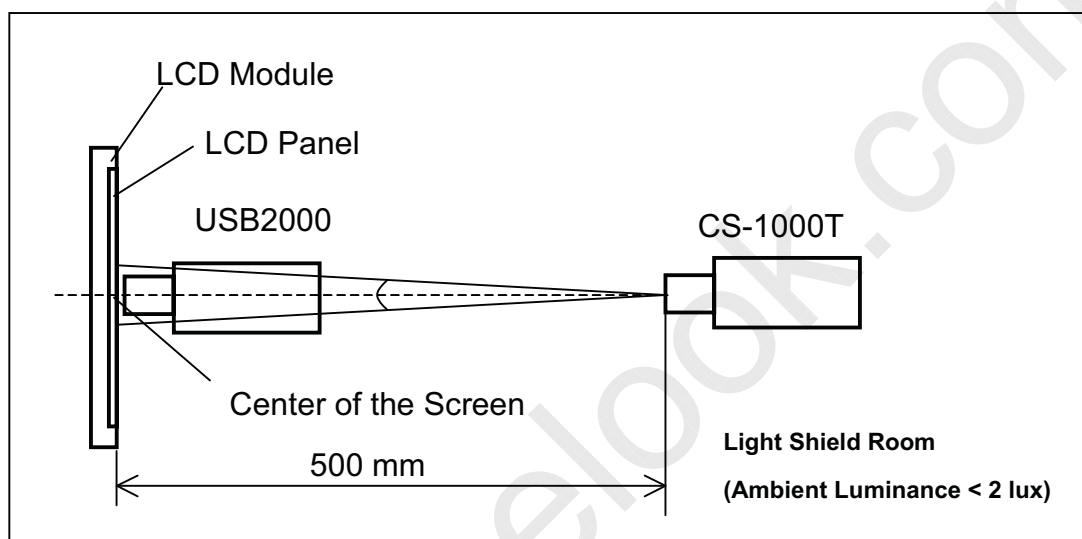


$$L_{AVE} = [L(1) + L(2) + L(3) + L(4) + L(5)] / 5$$

L(x) is corresponding to the luminance of the point X at Figure in Note (6)

**Note (5) Measurement Setup:**

The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.





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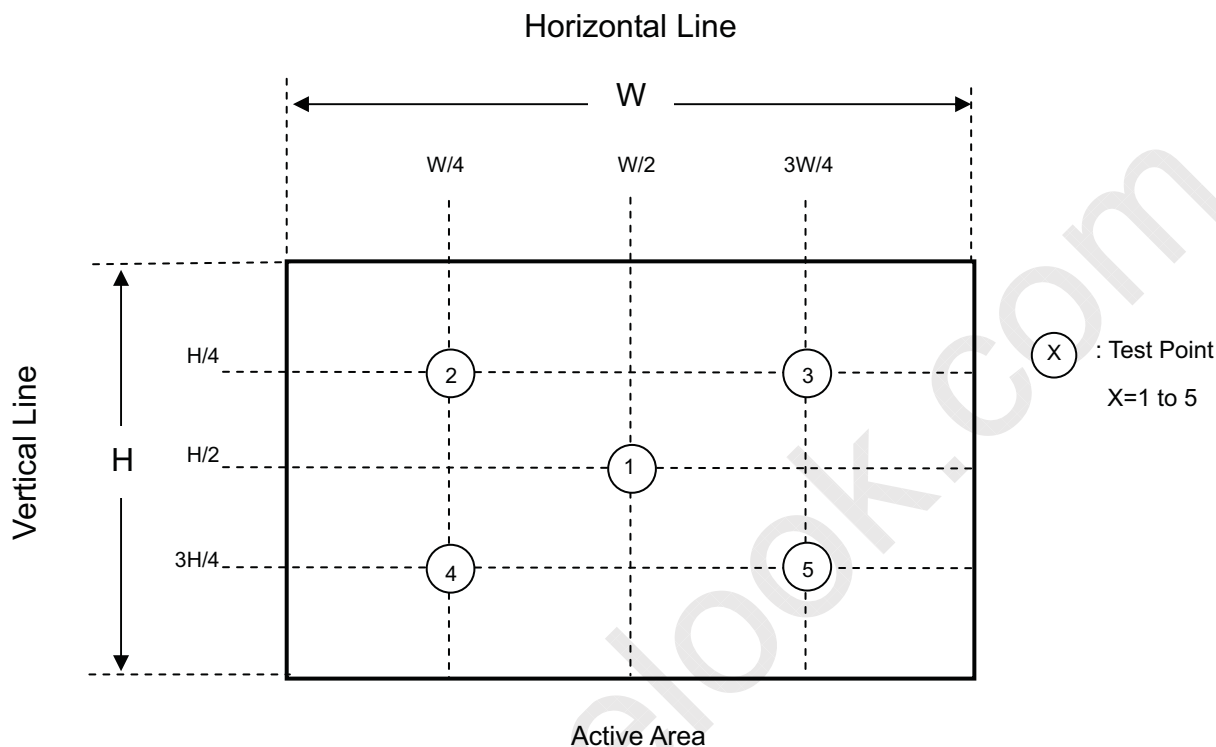
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Note (6) Definition of White Variation ( $\delta W$ ):

Measure the luminance of gray level 63 at 5 points

$$\delta W = \{ \text{Maximum } [L(1), L(2), L(3), L(4), L(5)] / \text{Minimum } [L(1), L(2), L(3), L(4), L(5)] \}$$





## 9. PRECAUTIONS

### 9.1 ASSEMBLY AND HANDLING PRECAUTIONS

- (1) Do not apply rough force such as bending or twisting to the module during assembly.
- (2) To assemble or install module into user's system can be only in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.
- (3) It's not permitted to have pressure or impulse on the module because the LCD panel and Backlight will be damaged.
- (4) Always follow the correct power sequence when LCD module is connecting and operating. This can prevent damage to the CMOS LSI chips during latch-up.
- (5) Do not pull the I/F connector in or out while the module is operating.
- (6) Do not disassemble the module.
- (7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.
- (8) It is dangerous that moisture come into or contacted the LCD module, because moisture may damage LCD module when it is operating.
- (9) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.
- (10) When ambient temperature is lower than 10°C may reduce the display quality. For example, the response time will become slowly, and the starting voltage of CCFL will be higher than room temperature.

### 9.2 SAFETY PRECAUTIONS

- (1) The startup voltage of Backlight is approximately 1000 Volts. It may cause electrical shock while assembling with inverter. Do not disassemble the module or insert anything into the Backlight unit.
- (2) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
- (3) After the module's end of life, it is not harmful in case of normal operation and storage.

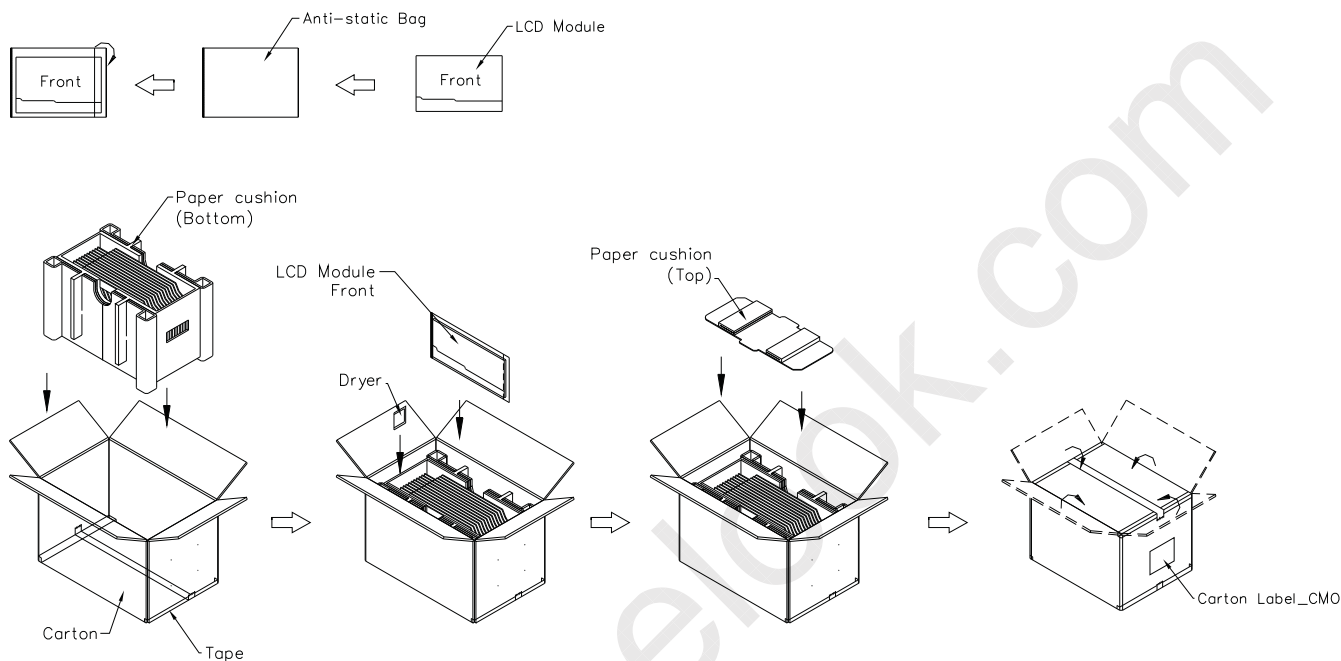


## 10. PACKING

### 10.1 CARTON

Box Dimensions : 490(L)\*325(W)\*320(H)

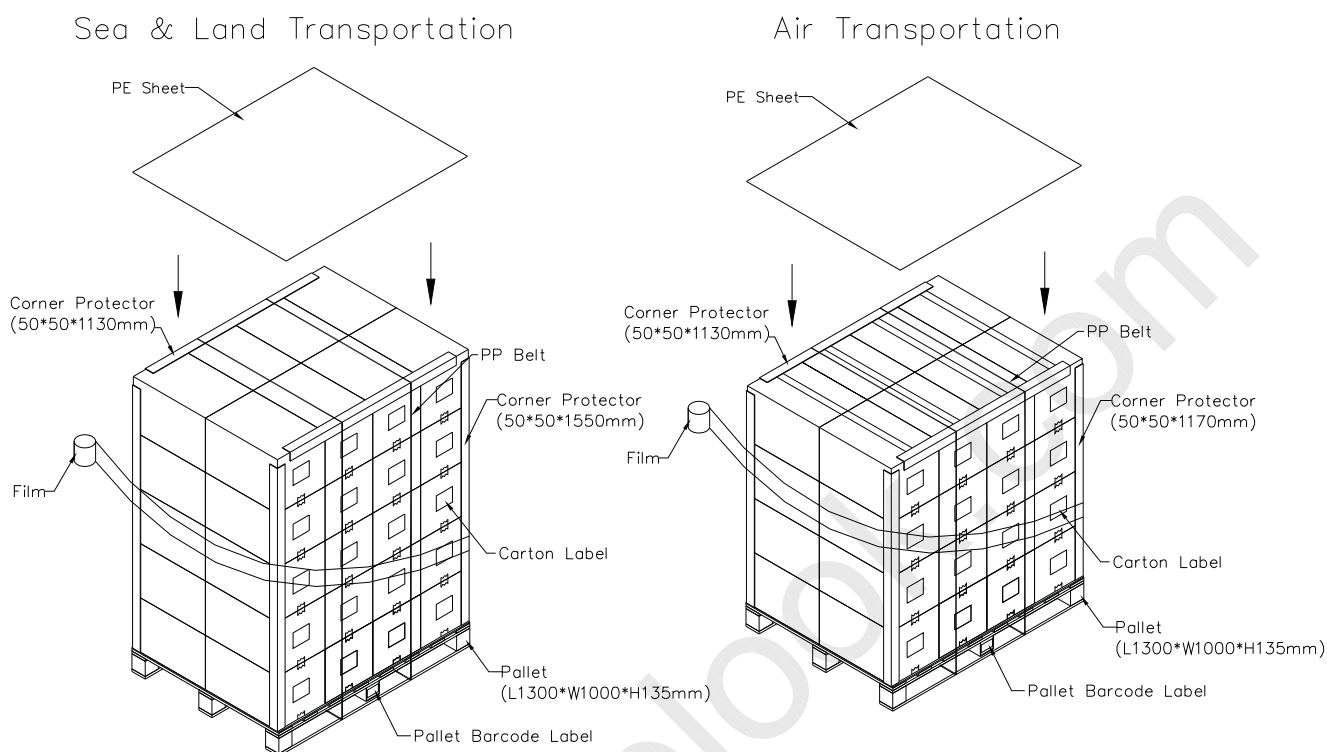
Weight: Approx. 11.3kg(15 module .per. 1 box)



**Figure. 10-1 Packing method**



## 10.2 PALLET



**Figure. 10-2 Packing method**


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Model No.: N173H6 - L02

**Tentative**

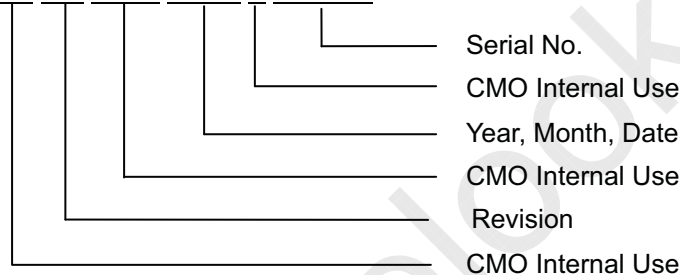
## 11. DEFINITION OF LABELS

### 11.1 CMO MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



- (a) Model Name: N173H6 - L02
- (b) Revision: Rev. XX, for example: A1, ..., C1, C2 ...etc.
- (c) Serial ID: X X X X X X Y M D X N N N N



- (d) Production Location: MADE IN XXXX. XXXX stands for production location.
- (e) UL logo: LEOO especially stands for panel manufactured by CMO NingBo satisfying UL requirement.  
The panel without LEOO mark stands for manufactured by CMO Taiwan satisfying UL requirement.

Serial ID includes the information as below:

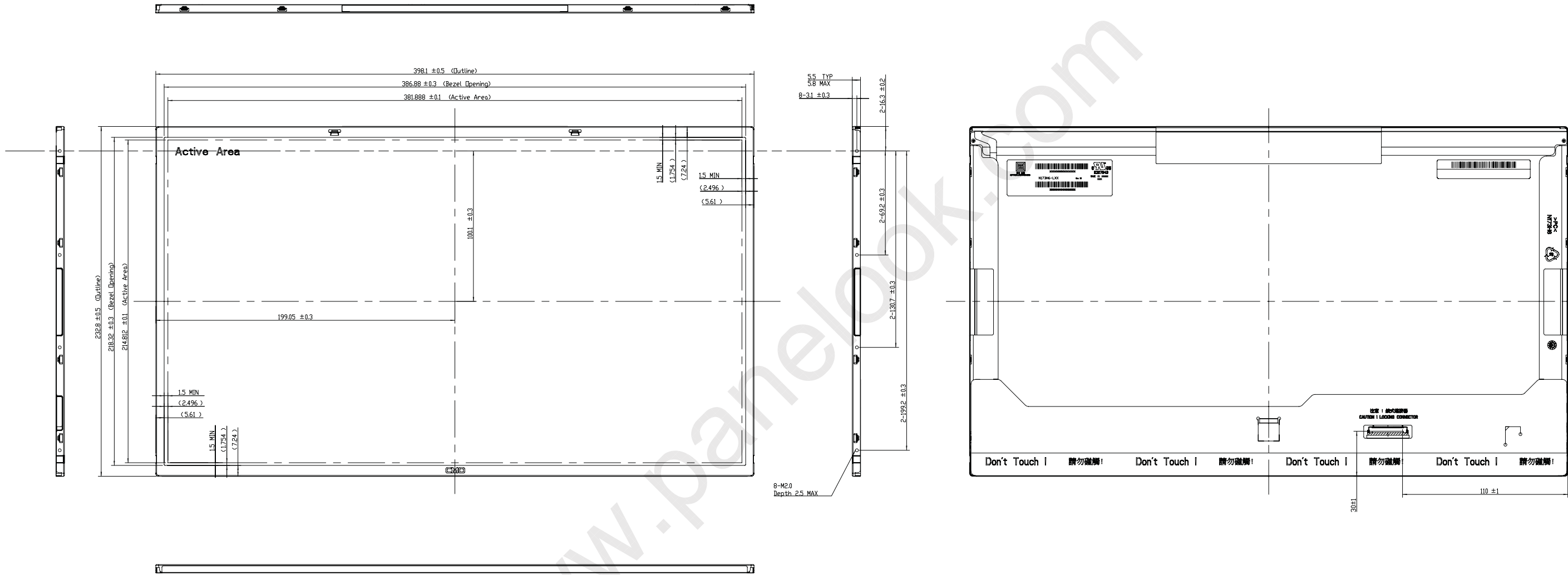
- (a) Manufactured Date: Year: 1~9, for 2001~2009  
Month: 1~9, A~C, for Jan. ~ Dec.  
Day: 1~9, A~Y, for 1<sup>st</sup> to 31<sup>st</sup>, exclude I, O and U
- (b) Revision Code: cover all the change
- (c) Serial No.: Manufacturing sequence of product



## 11.2 CMO CARTON LABEL

The image shows a sample of a CMO CARTON LABEL. It is a rectangular form with a light blue background and a grid pattern. At the top left, there is a small square logo with the letter 'm' inside. Below it, the text 'CHI MEI OPTOELECTRONICS' is printed. The form contains several fields for information: 'PO.NO.' followed by a line, 'Part ID.' followed by a line, 'Model Name' followed by a line, and 'Carton ID.' followed by a line. To the right of 'Carton ID.', there is a field for 'Quantities' followed by a line. In the center of the form, the letters 'CMO' are printed in a large, stylized font. At the bottom left, the text 'Made in XXXX' is printed. At the bottom right, there is a circular logo with 'GP' inside and 'RoHS' below it.

(a) Production location: Made In XXXX. XXXX stands for production location.



NOTES :

1. MAX SCREW LENGTH : 2.5mm.
2. MAX SCREW TORQUE : 2.0 kgf-cm.
3. LCD MODULE INPUT CONNECTOR : I-PEX 20455-040E-12, OR Foxconn GS13401-1110P-7F, OR COMPATIBLE CONN.
4. GAP BETWEEN BEZEL AND PANEL : 0.5mm MAX.
5. IN ORDER TO AVOID ABNORMAL DISPLAY, POOLING AND WHITE SPOT, NO OVERLAPPING IS SUGGESTED AT CABLES, ANTENNAS, CAMERA, WLAN, WAN OR FOREIGN OBJECTS OVER COF DRIVER IC, T-CON AND VR LOCATIONS.
6. LVDS CONNECTOR MEASURED AT PIN1 AND ITS CONTACT SURFACE.
7. FLATNESS SPEC 0.5mm MAX. @

|                                                                                                                     |            |             |             |                                         |             |
|---------------------------------------------------------------------------------------------------------------------|------------|-------------|-------------|-----------------------------------------|-------------|
| TITLE OUTLINE DRAWING N17396-L01/A.02                                                                               |            |             |             | PB REV.1.0                              |             |
| Approved                                                                                                            | Shunnan    | Drawing No. | N17324011   | PB REV.1.0                              |             |
| Checked                                                                                                             | Shunnan    | Part No.    | NA          |                                         |             |
| Drawn                                                                                                               | Philip Lau | Material    | NA          | Sheet                                   | 1 / 1 A0    |
| Designer                                                                                                            | Philip Lau | Date        | 14-Jan-2009 | Scale                                   | 1:1 Unitten |
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